Quality and equity of learning outcomes in francophone Africa

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Quality and Equity of Learning Outcomes in Francophone Sub-Saharan Africa

- background study for the UNESCO 2004 EFA Monitoring Report -

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1. Introduction

The objectives of *Education for All* as agreed upon in Jomtien and reinforced at the World Forum in Dakar encompass both, the aspect of access to schooling (quantity) and the aspect of learning outcomes (quality). In fact, various studies have shown that spending a few years in primary school is often insufficient to ensure the acquisition of even the most basic skills in reading, writing and calculus (Michaelowa 2001a, pp. 78f., Lockheed and Verspoor 1991, pp. 12ff., World Bank 1989, Saito 1998). Therefore, while access to education remains a necessary condition for learning, it must be complemented by certain quality standards without which the actual learning outcomes may remain very poor.

In many respects, African countries, and particularly the countries in francophone sub-Saharan Africa, appear to face the greatest challenge when it comes to progressing towards the *Education for All* objectives. According to Bruns, Mingat and Rakotomalala (2002, Tables 1.1 and 2.4) only 45% of African children complete primary school, and all francophone sub-Saharan African countries except Gabon and Togo show figures that lie below or around this regional average. Out of seven countries with primary completion rates at 25% or below, six are francophone. Moreover, although there has been notable progress in some countries like Benin, Guinea, Mali and Mauritania, in more than half of the francophone African countries, completion rates have stagnated or even declined over the 1990s. The difficulties faced by francophone sub-Saharan Africa are further exacerbated by current inefficiencies in the allocation of financial resources. In particular, a lot of resources are spent to finance grade repetition – to the detriment of enrolment and with the additional consequence of higher drop out (Mingat, Rakotomalala and Tan 2003, pp. 9f.). In 2000, primary repetition rates in francophone Africa stood at 19.8% as compared to 10.3% in anglophone Africa (and 2.2% in OECD countries) (UIS 2002, MINEDAF 2002, p. 50). In a multivariate regression analysis

with regional dummies Mingat and Suchaut (2000, p. 8) show that the relative disadvantage of francophone and especially Sahelian countries even holds when GDP per capita is corrected for.

As far as education quality is concerned, due to lack of comparable data, serious comparisons between francophone and other African countries are not yet possible. However, two major regional databases on primary student achievement in Africa have become available since the early 1990s. While the "Southern African Consortium for the Monitoring of Education Quality" (SACMEQ) provides data for anglophone Africa (Ross 1998), the "Programme d'analyse des systèmes éducatifs de la CONFEMEN" (PASEC)[1] provides data for francophone sub-Saharan Africa (see CONFEMEN 1999). Another well-known program, the "Monitoring Learning Achievement Project" (MLA) also provides data for various African countries, but with a special focus on adjustment to specific country caracteristics, and – at least initially – without the intention to enable cross-country comparisons (Chinapah 1997). For an overview on similar programmes in other world regions, see Griffin and Grisay (2004).

Today data sets such as SACMEQ and PASEC allow us to analyze the quality of education in terms of student performance on test items considered to be relevant by national pedagogues and decision makers. Moreover, they enable us to relate education quality to financial, human and physical inputs into the education system and to carry out school effectiveness research based on analytical methods which have become standard by now in many industrialized countries (see, in particular, Teddlie and Reynolds 2000, Riddell 1997, Scheerens 2000). And finally, they enable us to make country comparisons on the basis of mean outcomes, the distribution of performance, and the efficiency of resource use.

For the data to be used, the pre-requisite of it being widely known has to be fulfilled. As the "Programme d'analyse des systèmes éducatifs de la CONFEMEN" (PASEC) publishes its official reports only in French, they have not yet been accessible to many readers in parts of the world where French is not spoken. Moreover, some of the standard descriptive statistics typically displayed in the initial reports on outcomes of international student surveys have not been computed for PASEC so far, or have been computed only for selected countries. In order to promote a more informed international discussion on educational achievement in francophone sub-Saharan Africa, this study attempts to provide an overview over the outcomes of the PASEC surveys and over

1 CONFEMEN: Conférence des ministres de l'éducation des pays ayant le français en partage (i.e. the conference of education ministers of francophone countries across the world).

some of the analytical results based on studies by the CONFEMEN and external researchers. At the same time the purpose of this study is to shed light on the issues highly relevant to the *Education for All* objectives. For this reason, the focus will be on the least performing quantiles of the student population and on possible gender differences in achievement.

The data used stem from eleven country evaluations carried out between 1992 and 2001.[2] In each of these evaluations, students of grades 2 and 5 were tested in French and mathematics. As grade 5 is typically the last or second last grade of primary education, tests at the end of grade 5 provide a good basis for a cross-country comparison of students' learning throughout primary education. Similarly, grade 2 provides an overview of their capacities when they enter the education system, but when their adjustment to the language of instruction has already progressed to a level at which they can be expected to answer a test administered in French (which would often not be the case in grade 1).

Besides testing students' abilities, PASEC country evaluations also implied collecting information on students' family backgrounds, teacher and director attitudes, classroom and school equipment etc. This allows us to relate students' educational achievements to relevant characteristics of their learning environment and to analyze which factors are particularly relevant determinants of education quality.

Table A1 in the annex provides an overview of the countries covered, the year of assessment, some sample characteristics and a classification of sampled students according to gender, location and age. Typically, PASEC surveys use a stratified random sample of schools covering all regions in the country, with one class of 5th graders and one class of 2nd graders randomly drawn among the classes of these grade levels within the school, and 20 students randomly drawn within each class.[3] It is important to note that the tests used were identical only in Burkina Faso, Cameroon, Côte d'Ivoire, Madagascar, Senegal and Togo. For Guinea, anchor items for French can be identified so that the different scales can be made comparable. Data for all other countries must be considered with caution as at least the direct test results are comparable only under the assumption of tests identical in their level of difficulty, for which no supportive evidence is available. Tables and figures including all countries

2 Data for five of these countries can be obtained on CD-ROM (CONFEMEN 2002) from the CONFEMEN secretariat in Dakar (mail to: pasec@sentoo.sn).

3 For further details of the PASEC sampling procedure see the PASEC evaluation manual (PASEC 2000).

will therefore generally be provided only for relative statistics for which the scale is of minor importance.

As the intention of this study is to provide some insights into country performance with respect to the *Education for All* objectives, achievement of the best or even the intermediate students in each country appears to be less relevant. It is intended to monitor, however, to what extent students are unable to reach what we will define as the minimum learning requirements. Section 2 discusses the available evidence under this perspective. Section 3 analyses the disparities which exist within the countries and which may be responsible, at least partly, for the difficulties to provide all students with at least some basic knowledge and skills. Section 4 discusses the influence of various school environments on these disparities. In Section 5 this analysis is further refined in order to draw some conclusions with respect to educational policies conducive to better learning, especially for those students at the lower end of the ability scale. Overall conclusions will be presented in Section 6.

2. To what extent are school systems successful in equipping students with the basic knowledge and skills?

In order to provide an overview of the share of students who reach (or do not reach) a minimum level of knowledge and skills, first the corresponding basic requirements need to be defined. Optimally, they should be defined through an agreement of national policy makers across all countries concerned. As in PASEC countries no effort was made to reach such an agreement at the policy level, it is necessary to use alternative measures. One option is to consider which student score could have been expected if students had simply been guessing (Michaelowa 2001b, Bernard 2003). Given the number and design of multiple choice items, the percentage of correctly answered questions with pure guessing is around 25% with slight variations between subjects, grades and countries (as far they did not use the standardized version of the tests). Figure 1 displays the share of students doing worse than if they had been simply guessing. Whereas this share lies around or above 20% in the Central African Republic, Djibouti and Senegal, it is around or below 5% in Cameroon, Côte d'Ivoire and Madagascar. This shows considerable differences between countries with respect to the extent to which students are left behind within the primary education system. As the threshold of pure guessing could have been reached by students without any knowledge at all (i.e. without any schooling), it can be considered as the lowest conceivable minimum requirement. From this perspective, percentages above 10% as observed in the majority of countries in Figure 1 raise serious concerns about the effectiveness of primary education in francophone sub-Saharan Africa.

Figure 1 about here

It should be noted, however, that there are various problems with the indicator used so far. In particular, since the share of students at or below the threshold of guessing depends upon the difficulty of the test, comparability across countries with different tests is permissible only under the assumption of similar levels of difficulty. This assumption can not be tested because individual items of the older country evaluations are no longer accessible. However, there is some plausibility to this assumption as the curricula in French medium schools in Africa are typically very similar, the tests were all based on these curricula and in general a high number of common items was used across countries. For the six countries using standardized tests, the problem obviously does not arise at all.

A statistically more precise and less controversial measure, however, is the share of students below a relative cut-off point derived across all countries with truly comparable data. If we arbitrarily set this cut-off point at 25%, we can compare the different countries on the basis of how many of their students do or do not reach this internationally defined ability threshold. Figure 2 presents the available evidence for Burkina Faso, Cameroon, Côte d'Ivoire, Guinea (French), Madagascar, Senegal and Togo. In order to get a more concrete idea of what this 25th percentile cut-off point actually means, Box 1 shows some examples of test items that students precisely at this cut-off point can be expected to solve correctly with a probability of 50%. All those students with abilities below the threshold have an even smaller chance to solve these items correctly. In this study, these students will be considered as not achieving the minimum requirements in terms of the *Education for All* objectives.

Figure 2 about here

According to this indicator, again the Senegalese education system appears to face the greatest difficulties to ensure a minimum level of knowledge and skills for all students. Across both grades and subjects, the share of students below the 25th percentile cut-off point is the highest among all countries for which comparable data are available. More than 40% of all Senegalese students fail to reach this threshold in French in both grades and in mathematics in grade 5. With 35% or more students below the threshold, Guinea and Madagascar face similar difficulties in 5th grade in French. At the same time, Madagascar is the country with the smallest share of students below the threshold in mathematics. This performance difference between subjects may be related to the fact that at the time of the PASEC evaluation, French was not the language of instruction in Madagascar during the initial grades of primary education so that students got far less exposure to this language than in the other countries considered here.

Interestingly, Figure 2 also shows that countries change their relative position from 2nd to 5th grade. If countries start off with a relatively low share of students with serious learning deficiencies, but show a relatively high share of students in difficulty towards the end of primary education, this raises concerns with respect to the capacities of education systems to integrate rather than leave behind students with lower abilities. Evidence suggests that this may be a problem in Cameroon, Guinea and Madagascar, at least with respect to French. In order to have a closer look at the integrative capacity of education systems, Section 3 will compare the overall distribution of abilities within each country.

Box 1: Examples of items that a student at the lower 25th percentile cut-off point of the overall distribution of scores would be able to answer correctly with a probability of 50%

French assessment, 2nd year

Example 1: Marking the figure corresponding to the word "five"

entoure l'image qui va avec le mot :

Cinq

Example 2: Listening and filling in the missing letter (for "tomato")

écoute et écris la lettre qui manque :

. omate

Math assessment, 2nd year

Example 1: Simple subtraction (with values below 10)

écris le résultat de la soustraction sous le trait :

9
–
4
=

Example 2: Sorting numbers from lowest to highest value

écris les nombres du plus petit au plus grand :

18	14	5	20

French assessment, 5th year

Example 1: Mark the grammatically correct form of the verb

Entoure le verbe accordé correctement :

-Le chauffeur ralentit / ralentis / ralentissent à l'entrée du village

(→ Box 1 cont.)

Example 2: Understanding the usage of a medicine from its label

Dans une boîte de médicaments, on trouve la notice suivante : lisez-là attentivement et répondez aux propositions

PRIMALAN

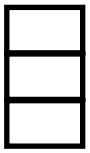
INDICATIONS :
- Dérangements intestinaux et plus spécialement:
- diarrhées
- vomissements.
POSOLOGIE:
- Adultes : 1 à 6 comprimés par jour.
- Enfants : de 3 à 5 ans ½ comprimé deux fois par jour;
au dessus de 5 ans: ½ comprimé 2 à 4 fois par jour.
- A prendre au début des repas en avalant avec un peu d'eau, sans croquer.
PRECAUTIONS D'EMPLOI :
L'usage prolongé de ce médicament peut entrainer des maladies du rein.

PROPOSITIONS :

1. Est-ce que ce médicament guérit la diarrhée ?

(Mets une croix en face de la bonne réponse)

- oui
- non
- le texte ne le dit pas



Math assessment, 5th year

Example 1: Sorting numbers from highest to lowest value

Classe les nombres du PLUS GRAND au PLUS PETIT:
Ecris ton classement sur les points

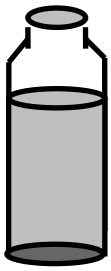
35,7	25,9	35,8	35,6
.....	.....	.....	.....

Example 2: Estimating the quantity of water in a one-liter bottle

Estime la quantité d'eau dans les récipients dessinés.
(Entoure la bonne réponse)

- La bouteille pleine fait un litre
  Sur le dessin, la quantité d'eau est de :

1 litre 0,75 litre 0,25 litre



3. How large are the disparities in learning outcomes across countries?

In the following, the distribution of learning outcomes within each country will be examined on the basis of the abilities reached by the median student, the student at the national 25th percentile cut-off point, and the student at the national 75th percentile cut-off point. On this basis, we will be able to compare the disparities between relatively high and relatively low performing students within each country and across countries.

Figure 3 shows the ranges of abilities on a scale with an international (cross-country) mean of 500 and a standard deviation of 100.[4] The lower and the upper triangles indicate student performance at the national 25th and the national 75th percentile cut-off point respectively. The dot in between indicates the median performance. It is interesting to note that this median performance does not vary much between countries and is generally less than half a standard deviation away from the international average. Conversely, abilities at the higher and lower ends of the national distributions vary considerably. Most strikingly, in 5th grade French in Madagascar, the ability level at the lower cut-off point lies almost two international standard deviations below the ability level at the lower cut-off point in any other country. Assuming that the distribution of skills within specific grades remains constant over time, differences between 2nd and 5th graders in a given country can be interpreted as a change in distribution as students proceed trough the education system.[5] Since Malagasy students show a much more uniform distribution of French skills in 2nd grade, this confirms and reinforces the earlier observation that the less performing students seem to be left behind over the years. In Cameroon, Guinea and Senegal, however, the situation appears to be somewhat less problematic than anticipated in Section 2 because many of the less performing students in 5th grade French seem to be situated directly on or only insignificantly below the minimum learning threshold defined earlier. This does not hold for mathematics where students at the lower end of the distribution show abilities that are two or more international standard deviations below the median in both Cameroon and Senegal.[6]

4 To compute the scale, an IRT one-parameter (Rasch) model was fitted jointly for the six countries with identical tests (Burkina Faso, Cameroon, Côte d'Ivoire, Madagascar, Senegal and Togo), and Guinean achievement data were adjusted to this scale on the basis of common anchor items (for French). It appears that fitting a two- or three parameter IRTmodel might have been more appropriate, but the complex data handling processes required were beyond the scope of this study.

5 Unfortunately, no time series information has been available for this study. The analysis of the PASEC panel data for Burkina Faso, Côte d'Ivoir and Senegal (currently being processed) will allow some more accurate interpretation of dynamic processes in the future.

6 For Guinea, no comparable data are available.

Figure 3 about here

At the same time, some countries show that primary education systems in francophone African countries can also achieve a considerable reduction in performance differences between students. The most striking example is Burkina Faso which shows extremely strong performance disparities in 2nd grade, but hardly any differences in 5th grade. Moreover, this homogeneity is reached at an acceptable level around the international mean.

Given the important performance disparities observed in most countries, it is interesting to examine to what extent they may be related to other criteria such as gender or location, and why this might be the case. Moreover, promoting gender equality in educational achievement is in itself a relevant part of the *Education for All* objectives.

Figure 4 shows that overall in PASEC countries, average test scores of girls tend to be lower than average test scores of boys. This disadvantage of girls appears to be more pronounced in mathematics (red columns) than in French (blue columns). In fact, in French at both grade levels, girls' mean score as a share of boys' mean score reaches or even slightly exceeds the 100% equality line in about half of the countries. Only in one exceptional case (5th grade in Mali) a significant disadvantage of girls can be observed (at a 5% level of significance). In mathematics, however, the 100% line is reached only in rare cases, and the lower performance of girls is significant in Côte d'Ivoire, Guinea, Mali, Senegal and Togo in 2nd grade, and in Burkina Faso, the Central African Republic and Mali in 5th grade.

Figure 4 about here

While girls' relative under-performance in mathematics is a well known phenomenon around the world in higher grades (see e.g. OECD/UNESCO-UIS 2003, p. 146ff.), this does not generally hold in primary education (see e.g. Mullis et al. 2000, p. 30). However, in francophone sub-Saharan Africa, just as girls' primary enrolment rates still lag behind those of boys, girls' achievement in primary education also tends to lag behind boys' achievement. While in other parts of the world, gender disparities start to be looked at from a perspective of reducing the under-performance of boys in language skills (reading and writing), in francophone sub-Saharan Africa increasing girls' performance remains a relevant challenge. Nevertheless, it should be noted that as compared to the overall achievement disparities observed above (Figure 3), the magnitude of gender differences appears to be rather small.

Given that some disparities remain, it appears to be of interest to analyze to what extent they may be related to child labor or to discrimination with respect to the provision of the relevant learning material. Unfortunately, PASEC information on child labor is not available in terms of duration but only in terms of the type of activities. Moreover, data stem from the students' own responses which could be unreliable to the extent that children may not always be willing to reveal that they have to work. Or, conversely, they may be unwilling to admit that they do not help at home. Finally, there may be a gender bias in reporting for certain activities because boys might avoid reporting an activity which is typically looked upon as a girl's job and vice versa.

Some activities such as dish washing, cleaning and child care seem to be particularly prone to such biases. And as they belong to those activities most children in any family across the world will have to carry out to some extent without any negative bearing on their studies, they are very difficult to evaluate without any information on duration. The following discussion will therefore fully exclude such kind of activities and be limited to the three remaining activities covered by PASEC: field work, animal husbandry and commerce.

Figure 5 shows that as reported by the children themselves, girls are less often involved in these activities than boys. Out of seven countries for which this information is available, this difference is significant in all but two countries (Côte d'Ivoire and Senegal). The number of activities stated increases from grade 2 to grade 5 indicating that older children have a higher probability to get involved in one or more of these tasks, but the differences between girls and boys remain about unchanged. It can be concluded that work in the areas of commerce, animal husbandry and field work are probably not responsible for the gender differences observed in achievement. However, it seems highly probable that girls are far more involved in household work. Unfortunately, PASEC data does not allow for this kind of analysis.

Figure 5 about here

In a second step, we shall consider the provision of learning material to boys and girls. Various studies have pointed out the particular relevance of textbooks for student achievement (see e.g. Michaelowa 2001b). Figure 6 depicts the distribution of textbooks by gender, subject and grade. While some countries show substantial differences between the availability of math books (red columns) and French books (blue columns), hardly any relevant gender differences can be distinguished.

Figure 6 about here

All in all, the available evidence does not allow us to determine any relevant factors responsible for the under-performance of girls. However, as this under-performance is anyway limited to mathematics and rather weak in terms of magnitude even there, there is only limited scope for improvement and even a more comprehensive set of data may not necessarily provide any further insights.

As can be seen from Figure 7, rural-urban disparities appear to be much more relevant. With the notable exception of Guinea, student achievement in rural areas is much lower than achievement in the cities. In Figure 7 this is reflected by columns far below the 100% equality line. The worst case is that of Djibouti in 2nd grade French where rural students' achievement in terms of correctly answered test items corresponds to only 60% of the test items answered correctly by urban students. It should be noted that this difference is made up for to a large extent in grade 5. This tendency can be observed for many other countries as well. It seems as if the education systems in Cameroon, the Central African Republic, Guinea, Djibouti, Madagascar and Senegal were able to mitigate existing rural-urban disparities over time. Only in Togo these disparities seem to rise rather than to diminish.

Figure 7 about here

In order to examine the determinants of rural-urban disparities, we can again examine the factors already considered in the context of gender differences. Figure 8 presents the available evidence on child labor. It appears that both in 2nd and 5th grade, about every second rural student reports at least one more task (among three) than his or her urban peer. Assuming that the time spent on these tasks is detrimental to learning, these differences may explain some of the rural-urban learning disparities. It should be noted, however, that in Guinea, the only country where rural students achieve higher scores than urban students, reported child labor in rural areas is particularly strong. Since we cannot expect a monocausal relationship and need to consider the possible influence of other variables, such individual exceptions may, however, easily be explained. The PASEC secretariat suggested, for instance, that the lower performance in urban areas in Guinea might be related to the high number of double shift classes which often imply a reduced number of effective working hours in class. Other possible explanations include NGO activities or specific educational policies targeted to rural areas. We will see that the latter finds some support through the analysis of the distribution of learning material.

Figure 8 about here

Considering the potential differences in the availability of relevant learning material we will once again concentrate on textbooks. Figure 9 presents the availability of textbooks by location, subject and grade. It appears that in all countries but Guinea, students in urban areas are more probable to have a textbook, both in French and in mathematics. In Togo (both grades) as well as in Senegal and Cameroon (grade 2) the share of rural students possessing a textbook is about 20% lower than the corresponding share of urban students.

Figure 9 about here

Moreover, it should be noted, that even where differences in the availability of textbooks are rather small (like in Burkina Faso and Madagascar), urban areas typically provide some viable alternatives if the equipment with learning materials in school itself is inadequate. For instance, missing textbooks may to some extent be substituted by access to a municipal library which will be far less probable to exist in a remote rural environment.

Therefore, both the greater necessity to work outside school and the generally more restricted access to learning material appear to be relevant factors to explain the higher scores obtained by urban students. These factors can be expected to be reinforced by the students' socio-economic background, parents' literacy etc., which all tend to be much more favorable to learning in an urban environment. Under these conditions, it is even more remarkable that, as noted above, quite a number of countries seem to succeed in compensating some of the rural disadvantages through adequate educational policies so that the rural-urban disparities tend to be reduced towards the end of primary education.

4. What role do schools play in contributing to the disparities in learning outcomes?

Another interesting way to examine the existing achievement disparities is to analyze whether they arise primarily within schools or between schools. It is obvious that the policy implications are quite different in either case. If disparities exist mainly between schools, educational policy aiming at enhanced equality needs to consider a more balanced allocation of physical and human resources to the different schools. Conversely, strong disparities within schools primarily call for pedagogical measures to ensure that none of the students are left behind in class.

Figure 10 shows that variation between schools exceeds one fourth of the total variation in all countries, but dominates over variance within schools only in the Central African Republic, Congo Brazzaville, Guinea and Madagascar. With the exception of Congo, its relevance increases from lower to higher grades, a fact that illustrates the long-term impact of a given school environment. The countries with the lowest relative impact of differences between schools are Djibouti, Mali and Senegal.

Figure 10 about here

To a certain extent, the relevance of variance between versus variance within schools may be driven by disparities in students' socio-economic background. If, for instance, living standards and levels of alphabetization are very low in certain areas of the country, this will obviously create differences in student achievement between schools in this area and other regions. At the same time, students' socio-economic background may also explain a major part of the achievement differences within given schools and classes. Regressing student achievement on variables reflecting their families' socio-economic background, it can be observed to which extent variance between schools remains relevant net of this effect. To control for the influence of the socio-economic background, two different variables are used. The first is an index based on the families' possessions of consumer durables, and a plow in case of rural families. The second is a variable indicating whether French is spoken at the students' home. These data are available for Burkina Faso, Cameroon, Côte d'Ivoire, Madagascar and Senegal. In Guinea and Togo, where the index of consumer durables could not be computed, the availability of electricity at home is used as a substitute.

As indicated in Table F10 in the annex, controlling for socio-economic background leads to a lower share of the variance between schools within the total variation of scores for all countries but Guinea. However, in all cases, changes are only small in terms of magnitude. This implies that generally, students' socio-economic background explains about as much of the variation within schools as of the differences between schools. Even after controlling for the influence of socio-economic background, over 25% of the overall variance of scores remain to be explained through differences in school environments. In Guinea, Madagascar and Togo (5^{th} grade), reducing differences between schools, i.e. addressing the deficiencies of certain schools including their human and physical resources, remains the primary policy concern if equality of learning opportunities is at stake.

In order to discuss which could be the most relevant factors to improve students' school environment, we can refer to many different studies already carried out on the basis of PASEC data for various countries. An initial survey was carried out by Michaelowa (2003) which is updated here with new information from the two most recent PASEC country evaluations in Guinea and Togo (CONFEMEN / MEN de Guinée 2003; CONFEMEN / MEN du Togo 2004). This survey addresses various aspects of the school environments, in particular: a) teacher competencies, b) class size and class management, and c) instructional material and physical infrastructure. These aspects will be considered in the following subsections.

4a. Teacher competencies

Teacher competencies vary widely across schools. In terms of educational attainment, some teachers completed several years of university education while others did not even clear the lower secondary completion exam BEPC in 10th grade. In most countries, the upper secondary completion exam BAC is a formal requirement to enter the teaching profession, but in many cases, these official guidelines are not observed in practice. Figure 11 presents the share of 2nd and 5th grade teachers with BAC and with some initial professional training for those countries for which this information is available. It may be interesting to note that in some countries, predominantly Togo and Côte d'Ivoire (for 5th grade), most of the teachers with higher educational attainment are concentrated in urban areas. Conversely in other countries, e.g. Burkina Faso and Senegal (for 2nd grade), teachers holding a BAC can be much more frequently found in rural areas. The urban-rural divide in terms of teacher competencies appears to be policy driven and varies greatly across countries and grades.

Figure 11 about here

The problem is that degrees often tell very little about the true capacities of teachers. In fact, as noted by Michaelowa (2003, p. 7) no significant correlation can be established between 5th grade teachers holding a BAC and their ability to correct a student's dictation (for Burkina Faso, Cameroon, Côte d'Ivoire, Madagascar and Senegal). This raises serious questions about the effectiveness of secondary education in these countries. While it is beyond the scope of this paper to discuss the effectiveness of secondary education, it must be noted that, under these conditions, a simple call for stronger requirements in terms of new teachers' educational attainment does not seem to provide a promising solution to problems of deficiencies in teachers' knowledge of the subjects they teach. Such policies are even more ambiguous as PASEC data also

provide strong evidence that currently, primary teachers with an educational attainment of BAC or beyond tend to be particularly dissatisfied with their professional choice. It seems that as long as academic education does not prepare teachers sufficiently well for their later job, there tends to be a mismatch between their expectations and the reality they will have to face. This leads to a lower motivation which in turn implies lower achievement of their students (Michaelowa 2002).

As far as initial pedagogical training is concerned, various alternatives often coexist or follow each other after educational policy reforms. They differ by duration but also by focus and relevance and are therefore extremely difficult to compare. The same is true for on-the-job training measures. The impact of teachers' professional education is therefore very difficult to assess within any given country, and even more so when it comes to cross-country comparisons.

Nevertheless, evidence for individual countries – and, particularly, recent evidence from Togo – suggests that initial pedagogical training for teachers may have a strong impact on their work performance (CONFEMEN / MEN du Togo 2004). In fact in Togo, it turns out that the initial professional teacher training is far more relevant than teachers' general educational attainment.

At the same time, PASEC evaluations typically indicate that duration – the only generally available measure – does not really matter; or at least that it matters far less than the focus and relevance of training does. Therefore, it often happens that teachers having gone through longer professional training periods reach lower scores for their students than other teachers with shorter training. In Guinea, for instance, teachers trained through the "Formation initiale des maîtres de Guinée" (FIMG)-program initiated in 1998 by the World Bank obtain very acceptable outcomes, especially in 5th grade, despite the fact that this program considerably reduced the duration of teacher training from 2 to 3 years to only 6 to 9 months (CONFEMEN / MEN de Guinée 2003). At the same time as duration was reduced, the focus of the training was reformed towards practical aspects of teaching and experienced teachers were appointed to follow and guide new teachers during their initial working period. This may have compensated for the shorter period of theoretical training.

4b. Class size and class management

The students' learning environment in their schools does not only differ with respect to teachers' competencies. Another relevant aspect may be the number of students in the

classroom. In the PASEC samples, class size ranges between less than 5 and more than 130 students. Country averages range from slightly below 40 in Togo to over 60 in Burkina Faso, with slight reductions in higher grades (see Figure 12). Extremely high student numbers are typically encountered in urban areas whereas schools in remote rural areas sometimes face the opposite problem and resort to regrouping students of different grades into one class (multigrade teaching) or to opening a new class at first grade level only every second year.

Figure 12 about here

While it is difficult to conceive how effective teaching should be possible at a class size of, say, 60 students or more, PASEC provides no consistent evidence on the impact of reducing student numbers. At the international level, there has been a long and ongoing debate about the relevance of class size. While authors such as Hanushek (1998) summarize the available evidence as little conclusive and caution against putting to much emphasis on the issue given the high cost involved, others draw the opposite conclusion and claim that important gains in educational quality will be possible by reducing class size, particularly at early grade levels (see e.g. Biddle and Berliner 2002). Looking at other international comparisons of student achievement like PISA shows that some of the Asian countries with very high average class size manage to be among the top performers on a world-wide scale (OECD/UNESCO-UIS 2003). Of course, many unobserved factors may blur this kind of comparison. Moreover, the difficulty to find the expected significant relationship may be related to problems of econometric specification (non-linearities, omitted variable bias and / or the endogeneity of class size). It remains that for the time being, PASEC results on class size are far from conclusive (see Annex, Table A3).

One commonly suggested way to deal with high student numbers under given restrictions in terms of human and physical resources, is to simply cut the students' group in half and to administer classes to one group in the morning and to the other group in the afternoon (double shift classes). PASEC data show, however, that this solution comes at a high cost in terms of student performance (Michaelowa 2001b). The problem seems to consist in the extreme burden for the teacher in case he or she teaches both shifts, and even otherwise, in the generally reduced time effectively spent in class with each of the groups. Moreover, the timings of those shifts cannot be properly adjusted to the families needs and to climatic conditions, so that students tend to miss classes more often and to follow less actively, even if they are present (CONFEMEN / MEN de Guinée 2003). PASEC evidence suggests that particularly

when the practice of double shifts is followed throughout primary education, the cumulative effect may prove truly detrimental to students' learning (CONFEMEN / MEN de Guinée 2003).

As there are several ways to introduce double shifts, to ensure students' presence in class and to minimize losses in terms of effective teaching time, some further experimentation and research on the issue of double shift classes appears to be appropriate and may lead to more promising results.

4c. Instructional material and physical infrastructure

One further aspect when it comes to differences in school environments is obviously the schools' infrastructure and the availability of teaching material. PASEC does include considerable information on both physical infrastructure and instructional material. Information on physical infrastructure includes the construction material of the school building, the availability of electricity, and the availability of different facilities such as bathrooms, a sanitary room, a fresh water point, office rooms and housing, a court yard etc. Moreover, there is information on the size of the classroom as well as the available furniture. Information on instructional material includes the availability of textbooks, copy-books, slates, pens or pencils, teachers' manuals, a blackboard, chalk, instruments for geometry and wall maps.

However, only few of these variables appear in the regression models published so far. It seems that the indicators constructed on the basis of the other variables were mostly insignificant and therefore left out in the final models. The indicator of basic equipment used in Michaelowa (2000 and 2001a) was significant only in one regression specification out of seven (see Table 1). A considerably higher number of studies includes the effect of electricity, but even here the evidence is far from conclusive. An unambiguously positive effect can be shown for teacher manuals, but the effect is considered only in five studies and does not always turn out to be significant.

Table 1: The effect of educational equipment on student achievement, a synthesis of PASEC regression results

	Textbooks			Other equipment		
Number of regressions with coefficient being:	French	Math	French & Math	Teacher manuals	Electricity	Basic equipment[1]
Positively significant	20	7	17	2	4	1
Negatively significant	0	0	0	0	2	0
Insignificant	19	21	3	3	10	6
Total number of regressions considering this factor	38[2]	28	20	5	16	7

[1] "Basic equipment" refers to the joint availability of a teacher's desk, a usable blackboard, seats and desks for all students, white chalk, pencils and copy books or slates for at least 75% of the students.
[2] The sum of coefficients is higher than the total number of regressions because one regression used two different variables implying two different coefficient estimates.
Annotation: Significance refers to a level of α=10%.
Source: Annex Table A3.

Table 1 shows that only with respect to textbooks for math and French taken together, the link to student learning appears to be strong and consistently positive. When books for both subjects, math and French, are considered separately in the same regressions, the effect comes out less clearly since both variables are highly correlated. Moreover, in this case, the impact of the French textbook generally dominates. This is little surprising because being able to read French is relevant for both subject matters.

It should be noted that different variables were used to measure the availability of textbooks. While in some studies, the possession of a textbook is identified at the level of each individual student, other studies use the percentage of students with textbooks within the class as the relevant variable. The latter specification reflects the idea of peer effects: even if a student does not personally possess a textbook, he or she might benefit from his or her neighbor's textbook. Based on this variable, Michaelowa (2001a, p. 1707) shows that, other things being equal, students in a class where each child has a textbook in both French and mathematics score 6.6 to 8 percentage points higher than students in a class with no books. A difference of 8 percentage points corresponds to almost 18% of mean scores and is therefore highly relevant.

However, some caution is required when interpreting this result. As the availability of textbooks is correlated to the children's socio-economic background, coefficients may be overestimated whenever this background is not correctly controlled for (Naumann, Trapp and Wolf 2002, p. 4). A similar reduction of the impact is noted by Waller (2003). Nevertheless, the coefficient of textbooks generally remains significant even in models where much care was taken to eliminate the bias of socio-economic background (see e.g. Annex, Table A4). Enhancing the availability of textbooks should therefore remain a priority of educational policy.

It should be noted that the literature suggests that even higher gains might be possible, if French were to be replaced by the children's local language during the initial years of primary schooling, and replaced only gradually thereafter. Correspondingly, textbooks in these local languages may be even more relevant than textbooks in French, in particular for the early grades (Naumann and Wolf 2001). Moreover, as already noted by Lockheed and Verspoor (1991, p. 52), the simple provision of textbooks does not

guarantee their use. Adequate training for the teachers who are supposed to use these books appears to be necessary.

Overall, we can conclude that among all variables of instructional material and physical infrastructure, textbooks in the language of instruction most clearly influence education quality. Despite growing awareness of the importance of this learning tool, it still seems that many developing countries first try to ensure the quality of the school building and the appropriateness of other physical infrastructure. For instance, PASEC data show that the percentage of concrete schools in Burkina Faso, Cameroon, Côte d'Ivoire and Madagascar (Bernard 1999b, p. 20) is much higher than the percentage of textbooks available to fifth grade students (Michaelowa 2001a, p. 1710). In a perspective of setting priorities in order to make the best use of given financial means, the right balance between physical infrastructure and the availability of textbooks should be reconsidered.

5. What do these results suggest regarding educational policies that can improve the quality and equity of learning outcomes?

The preceding sections have provided an overview of learning outcomes, disparities between and within countries and a variety of policy measures to enhance education quality. It turned out that ensuring some initial professional teacher training and reforming its focus and content might be a promising measure to enhance teachers' competencies and students' learning. Such reforms do not even need to come at a high cost, as the duration of such training courses may be rather brief (as in the case of the FIMG program in Guinea) and, to a certain extent, they may efficiently substitute for prevailing requirements in terms of academic degrees. With respect to class size, despite extremely high student numbers in many urban schools, no conclusive evidence could be presented. However, it turned out that the introduction of double shift classes to reduce class size without additional investment in buildings often comes at a rather high cost in terms of student learning. It appears to be important to investigate into the specific conditions under which the double shift system may work most efficiently. Finally, when it comes to the equipment of schools and classrooms, it appears that instructional material, i.e. particularly the availability of textbooks, is of greatest relevance.

While all these results taken together may appear as a valid policy mix, it should be noted that all the underlying discussions were based on prior regression analysis establishing determinants of learning achievement for the average student. At the outset

of this study, however, our primary concern was how to achieve minimum learning for all, i.e., in particular, how to improve the outcomes of low performers. It is well conceivable that high and low performing students differ with respect to the impact of teaching material, teacher competencies and other relevant determinants of learning outcomes. In this case, the assumption of constant coefficients in prior regression analysis may blur the appropriate conclusions about the policy requirements to specifically help those students left behind in the education system.

In order to shed some light on potential specificities of low performing students, the regressions carried out for this study allow all coefficients to take a different value for students at or below the lower 25th percentile cut-off point (see Annex, Table A4). The regression model includes performance at the beginning of the year among the control variables in order to distinguish the impact of characteristics of the teaching and school environment during the year of assessment from any prior influences on achievement. The analysis is carried out jointly for six countries (Burkina Faso, Cameroon, Côte d'Ivoire, Madagascar, Senegal and Togo) and based on average scores in French and mathematics.

Table 2 about here

The overall results of the model confirm the results discussed above. The availability of textbooks shows the expected positive significant impact while double shift shows a strong negative impact (significant only in grade 2 but almost significant in grade 5). The variable class size is significant only in one specification and with a rather small coefficient. Teachers' education measured merely in terms of academic and professional degrees does not show any significant effect. Students in urban schools are ahead of students in rural areas, and this difference remains significant in grade 5 even after control variables for the background and equipment were included in the regression equation. This implies that some of the disadvantages of the rural environment are not yet captured in the model. Moreover, as expected, students' family background plays a relevant role in explaining their achievement. The higher the family wealth measured in terms of certain consumer durables, the higher is student performance. In addition, students speaking French at home have a clear advantage over their peers who only speak local languages, especially in the early grades. Moreover, the necessity to participate in work outside school (commerce, animal husbandry and / or field work) shows a clear negative impact in grade 5 where – as we have seen earlier – these activities become a more common feature of students' daily life.

The only significant variable with opposing signs in the two grade levels considered is the teacher's gender. A male teacher appears to have a detrimental effect on younger students' but a positive effect on older students' learning. This appears to confirm the current practice of allocating female teachers predominantly at lower grades. At the same time, the significant coefficients might also be related to some particularities of the exceptions to these rules which cannot be captured in our model.

In both specification, students' age appears to have a significantly negative impact on achievement. It should be noted that age captures not only the earlier or later beginning of each child's schooling but, more relevantly, the frequent repetitions extremely common in francophone sub-Saharan Africa. PASEC results have frequently shown that these repetitions tend to be ineffective if not counterproductive in the long run – a result which finds clear confirmation here.

Now turning to specific characteristics of low performing students, some interesting additional features can be observed. It appears that the negative effect of a higher age interpreted above as a negative effect of grade repetition is significantly less relevant for weak students. This picks up an issue discussed over and over again in PASEC studies: the evidence of inefficient targeting when it comes to decisions on students' repetition. While grade repetition may be beneficial for a small percentage of extremely weak students, typically almost 40% of those requested to repeat belong to the group of intermediate and even well performing students in standardized PASEC tests (see e.g. CONFEMEN / MEN du Sénégal 2004 or Michaelowa 2003). This calls for a revision of repetition policies and a much more restrictive use of grade repetition in current educational practice.

A second variable showing a significantly different coefficient for weaker students in both the grades is the test score of the initial test at the beginning of the year. This indicates that low performers do not only start off from a lower level of initial achievement, but that their progress over the year also tends to be less than proportional, i.e. considerably slower than that of their peers- even relative to the different starting points. This reflects the cumulative process of skill acquisition resulting in a growing gap between good and bad performers if no counterbalancing action is taken through education policy.

Generally, the relevance of the most important factors related to the school environment (teacher competencies, class size and management, instructional material) seem to hold for all students irrespective of their ability level. The only notable exception is

textbooks. In fact, surprisingly, the relevance of textbooks for low performing 2nd grade students appears to be smaller than for other students. This raises concerns about the extent to which the least performing students are actually able to make use of the textbooks they possess. In parts, this may be related to a language problem if French as the language of instruction is not mastered sufficiently well to understand the written text. This interpretation finds some support by the fact that the problem does not reappear in grade 5. It calls for special pedagogical support for the weakest students in order to enable them to make a more efficient use of those basic learning materials and to help them not to fall behind from the very beginning of their educational development.

With respect to class size, in 5th grade where the coefficient showed the expected negative sign, students under the threshold of underachievement seem to benefit significantly less from a reduction in student numbers. While this tends to confirm, once again, the inconclusive evidence on class size, it is very difficult to find a plausible explanation for this phenomenon. It should be noted, however, that the downward adjustment of the impact of various determinants of student achievement for the weak students, seems to be a more general feature. In fact, the above discussion on textbooks in 2nd grade or even on the impact of the initial knowledge assessed through the pre-test both point in the same direction. And the same effect can be observed for the variables capturing socio-economic background or for the impact of teachers' gender. We conclude that whatever significant impact is observed for the average student tends to matter to a lesser extent to weak performers.

Unfortunately, among the determinants of learning achievement considered here, not a single policy measure can be identified that would have a higher rather than a lower impact on weak students and which could therefore represent a policy priority when it comes to reducing disparities rather than increasing average skills. Overall, the policy measures advocated beforehand remain relevant, but their impact on those students at the end of the performance scale may be less than initially assumed.

Finally, it should be noted that both in 2nd and 5th grade, the coefficients of all country dummies differ significantly between average and under-achieving students. This indicates that there remain considerable differences across countries which cannot be explained through our simple model. Based on these differences, a more detailed (qualitative) cross-country comparison could attempt to reveal some additional insights with respect to specific policy instruments addressing the least performing students.

Conclusions

In order to promote a more informed international discussion on educational achievement in francophone sub-Saharan Africa, this study provided an overview of the outcomes of the PASEC student surveys and of some of the analytical results based on studies by the CONFEMEN and external researchers using the same data. As francophone sub-Saharan African countries face a particularly great challenge to reach the *Education for All* objectives - even within Africa - a closer analysis of the problems in this region is particularly warranted.

Differences in student achievement within and between countries

Starting with a presentation of existing problems of under-achievement in francophone African primary education, this study has shown where these problems persist and suggests some policy interventions conducive to improved educational outcomes for all students. One initial finding is that differences in student achievement are much more pronounced within countries than between countries. In this context, gender differences do not play any major role. Disparities between learning opportunities in urban and in rural areas, however, remain a largely unresolved problem, with Guinea being a rare exception. As illustrated by the example of textbook availability, this is partly due to an inferior equipment of rural schools. Moreover, rural areas present a higher evidence of child labor which becomes a relevant obstacle to learning particularly at higher grade levels.

Rural-urban disparities also contribute to the explanation of a large share of between school variation within the overall variation of scores. The share of the variation due to differences in schools tends to increase with higher grades. In the Central African Republic, Congo Brazzaville, Guinea and Madagascar this share reaches more than 60% in grade 5. However, despite some increase from 2nd to 5th grade, the share remains below 40% in Djibouti, Mali and Senegal.

Measures to improve learning outcomes in schools

In order to improve learning outcomes, policy measure therefore need to focus on both, the school and the family environment. As far as schools are concerned, this study reviews results of prior multivariate regression analysis on the basis of PASEC data. Positive impacts can be expected notably from a reform of teacher training and a greater availability of textbooks. The effect of reductions in class size is less conclusive, despite

the extremely high student numbers in many countries, predominantly in urban areas. Regression results also caution against the introduction of double shift classes which appear to have strongly detrimental effects on learning. As double shift classes can be conceived in various different ways, it may, however, be worthwhile to consider under which conditions this system may lead to improved results and represent a real alternative to teaching a single shift in an overcrowded classroom.

Particular needs of the weakest students

As *Education for All* implies a particular concern for the weakest students rather than a general effort to enhance average performance, it is necessary to assess whether these findings hold for low performing students and other students alike, or whether weak students may have specific characteristics changing some of the effects discussed above. Therefore, this study introduces a new regression model which indeed suggests the modification of some of the parameters derived from earlier work. In particular, it seems that in grade 2, very weak students need some extra help to be able to use their textbooks effectively. This may be related to initial problems to understand the language of instruction (i.e. French, the language in which these textbooks will be written). Moreover, it turns out that grade repetition, generally detrimental to learning progress, may be useful for a small percentage of really weak students. This calls for a generally reduced and more precisely targeted use of grade repetition.

Due to the introduction of a measure of initial skills at the beginning of the school year, it can also be observed to what extent learning is a cumulative process involving the great risk of a rising gap between low and high performers. Even relative to their already lower starting point, weak students tend to show much smaller progress throughout the year of measurement both in 2nd and in 5th grade. This problem is aggravated through the fact that for all relevant policy variables considered here, weak students seem to benefit less than the average student. This increases the difficulty to mitigate existing learning disparities. In order to attain the *Education for All* objectives, developing innovative ideas about how to effectively reach the students at the low end of the ability scale remains an important challenge.

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